Remarks

Claims 1-11 are pending in this application. Claims 6-11 are allowed. Claims 1-5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Phadke (U.S. Patent No. 6,788,557) in view of Gu et al. (U.S. Patent No. 5,907,223). The invention is believed to be patentable.

The invention relates to fluorescent lamp electronic ballasts and to power factor correction for fluorescent lamp electronic ballasts. Conventional fluorescent lamp electronic ballasts are not able to accommodate the varying-frequency input from, for example, wild frequency AC generators employed by aircraft manufacturers. Conventional ballasts that use a hold-up capacitor or passive power factor correction (PFC) L-C filters on the input and conventional ballasts that use PFC boost converters are either not able to operate or operate poorly with a varying-frequency input such as that provided by a wild frequency AC generator.

The invention involves an improved fluorescent lamp electronic ballast that includes a power factor correction flyback circuit and an invertor ballast circuit. The invention further involves a number of more detailed aspects that are usable in various combinations. Preferred embodiments of the invention are better able to accommodate varying-frequency input than conventional ballasts.

Claim 1 recites a fluorescent lamp electronic ballast comprising a power factor correction flyback circuit and an inverter ballast circuit. The power factor correction flyback circuit is composed of a rectifier connected to a DC to DC flyback converter. The flyback converter includes a flyback transformer connected to a diode/capacitor combination. The flyback converter includes a switch used to switch the flyback transformer during operation to produce a flyback waveform that is rectified by the diode and results in a DC output at the capacitor. The inverter ballast circuit receives the DC output and inverts the DC output to an AC signal for operating the fluorescent lamp.

Phadke describes a single conversion power converter with hold-up time. Phadke does discuss flyback power converters. According to Phadke, a capacitor is charged through a separate winding and controlled to provide energy to the converter only following the failure of the input voltage. Phadke is about using a smaller and less costly hold-up capacitor compared to known converters. There is no motivation to modify Phadke in view of Gu et al. to achieve the claimed invention.

The Examiner states that it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the device of Phadke with the inverter ballast circuit as taught by Gu et al. in order to deliver the high frequency AC power to the lamp from the DC output voltage of the flyback converter for operating the light system. Applicants disagree.

There is no motivation to modify Phadke in view of Gu et al. to achieve the claimed invention as recited by claim 1. Claim 1 involves a specific arrangement involving a PFC flyback converter and inverter ballast circuit receiving the DC output from the converter and inverting the DC output to an AC signal for operating the fluorescent lamp. Claim 1 recites a specific arrangement that overcomes problems in conventional ballasts such as those that use a hold-up capacitor or passive power factor correction L-C filters on the input, or that use PFC boost converters.

In response to the Examiner's assertion that the claimed combination of claim 1 would have been obvious, Applicants contend that there is no motivation to drive a fluorescent lamp with the device of Phadke in the particular way recited by claim 1. If one of ordinary skill in the art were interested in driving a fluorescent lamp, one of ordinary skill in the art would employ one of the conventional power supply approaches used for powering fluorescent lamps as found in conventional ballasts including those that use a hold-up capacitor or passive power factor correction L-C filters on the input or PFC boost converters. In contrast to the statements made by the Examiner, if one of ordinary skill in the art wished to drive a fluorescent lamp, one of ordinary skill in the art would choose a different power converter than that described by Phadke. One of ordinary skill in the art would choose one

of the ordinarily used power converters for driving fluorescent lamps. There is no suggestion to use the power converter in Phadke, and there is no suggestion to modify Phadke to meet all required limitations of claim 1.

Regarding Gu et al., Gu describes a two-frequency electronic ballast system having an isolated PFC converter. The PFC converter incorporates an isolation transformer, and a DC-AC inverter is provided on the secondary side of the isolation transformer. The switching frequency of the PFC converter can be significantly higher than the lamp current frequency. In the exemplary embodiment described by Gu, the PFC converter includes a DC-DC converter and a dither power factor correction circuit provided on the primary side of the isolation transformer.

The Examiner has acknowledged that Gu fails to anticipate the claimed invention, and the current rejection is based on Phadke in view of Gu.

Applicants have invented, as recited by claim 1, a specific arrangement involving a PFC flyback converter and inverter ballast circuit. There is no motivation to combine Phadke and Gu to achieve the claimed invention. Again, if one of ordinary skill in the art desired to drive a fluorescent lamp, one would choose one of the power converters traditionally used for such purposes in conventional ballasts. There is no suggestion to modify Phadke to drive a fluorescent lamp and to achieve a fluorescent lamp electronic ballast having all required limitations of claim 1.

For reasons given above, claim 1 is believed to be patentable.

Claims 2-5 are dependent claims and are also believed to be patentable. In addition, claims 2-5 are believed to recite further patentable subject matter.

Claim 2 specifically recites the rectifier receiving an AC input having a varying frequency and the rectifier having a sufficiently low input capacitance such that the rectifier output substantially takes the form of a rectified AC wave. The Examiner makes general

reference to Figures 1-2 of Gu and 3A-3B of Phadke, but there is no suggestion of the specific arrangement involving a PFC flyback converter including a rectifier having the recited sufficiently low input capacitance and driving an inverter ballast circuit.

Claim 3 recites transition mode operation of a flyback converter. The Examiner makes reference to Phadke, but Applicants again note that there is no motivation to use the power converter of Phadke to drive an inverter ballast circuit.

Claims 4-5 recite specific details of a control loop configured to monitor the flyback transformer, and switch the transformer asynchronously to maintain energy balance. The Examiner again makes general reference to Gu, however, to the extent that any feedback control is shown in Gu, there is no suggestion of using the particular features recited by claims 4-5 in the particular combinations captured by Applicants' claims.

For the reasons given above, claims 1-5 are also believed to be patentable, and Applicants respectfully request that the Examiner reconsider this application and allow the remaining claims.

Respectfully submitted,

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